Electronic Version
Stylesheet Version v1.1.1

Claims

[c1] 1.A method for separating a video signal into a luminance signal and a chrominance signal, the video signal being sampled from a composite color TV signal according to a sampling frequency, the method comprising the following steps:

(a) generating a target video signal and a plurality of reference video signals by delaying the video signal;

(b) generating an HCS according to the target video signal;

(c) generating an SLFD according to the target video signal and the plurality of reference video signals;

(d)generating a UDFD and a plurality of VRVSs according to the target video signal and the plurality of reference video signals;

(e) generating a VCS according to the UDFD and the plurality of VRVSs;

(f) generating the chrominance signal of the video signal by determining the HCS, the VCS, and the SLFD; and

(g) generating the luminance signal of the video signal according to the chrominance signal of the video signal and the plurality of reference video signals.

[c2] 2.The method of claim 2, wherein the plurality of reference video signals generated in step (a) comprises a first URVS, a second URVS, a first DRVS, and a second DRVS, the video signal being the second DRVS, the first DRVS lagged the video signal by a predetermined numbers of scan lines, the target video signal lagged the first DRVS by the predetermined numbers of scan lines, the first URVS lagged the target video signal by the predetermined numbers of scan lines, and the second DRVS lagged the first URVS by the predetermined numbers of scan lines, and step (d) comprises the following steps:

(h) generating a first UVS according to the target video signal and the first URVS;

(i) generating a second UVS according to the first URVS and the second URVS;

(j) generating a first DVS according to the target video signal and the first DRVS;

(k) generating a second DVS according to the first DRVS and the second DRVS;

(l) generating a $Diff_{up}$ according to the first UVS and the second UVS;

(m) generating a $Diff_{dn}$ according to the first DVS and the second DVS; and

(n) generating the UDFD according to the $Diff_{up}$ and the $Diff_{dn}$.

[c3] 3.The method of claim 2, wherein the UDFD is equal to $Lim(Diff_{dn}-Diff_{up})$, Lim() being a Sigmoid-like curve.

[c4] 4.A video signal separator for separating a video signal into a luminance signal and a chrominance signal, the video signal being sampled from a composite color TV signal according to a sampling frequency, the video signal separator comprising:

a plurality of delay circuits for generating a target video signal and a plurality of reference video signals by delaying the video signal;

an HCS generator for generating an HCS according to the target video signal;

an SLFD generator for generating an SLFD according to the target video signal and the plurality of reference video signals;

a VCS generator for generating a VCS, the VCS generator comprising:

a UDFD generator for generating a UDFD according to the target video signal and the plurality of reference video signals; and

a VRVS generator for generating a plurality of VRVSs according to the target video signal and the plurality of reference video signals;

wherein the VCS corresponds to the UDFD and the plurality of VRVSs;

a chrominance signal generator for generating the chrominance signal of the video signal by determining the HCS, the VCS, and the SLFD; and

a luminance signal generator for generating the luminance signal of the video signal according to the chrominance signal of the video signal and signals output from the plurality of delay circuits.

[c5] 5.The video signal separator of claim 4, wherein the plurality of reference video signals comprises a first URVS, a second URVS, a first DRVS, and a second DRVS, the video signal being the second DRVS, the plurality of delay circuits comprising:

a first delay circuit for generating the first DRVS by delaying the video signal by a predetermined numbers of scan lines;

a second delay circuit for generating the target video signal by delaying the first DRVS by the predetermined numbers of scan lines;

a third delay circuit for generating the first URVS by delaying the target video signal by the predetermined numbers of scan lines; and

a fourth delay circuit for generating the second DRVS by delaying the first URVS by the predetermined numbers of scan lines;

the VRVS generator comprising:

a first UVS generator for generating a first UVS according to the target video signal and the first URVS;
a second UVS generator for generating a second UVS according to the first URVS and the second URVS;
a first DVS generator for generating a first DVS according to the target video signal and the first DRVS; and
a second DVS generator for generating a second DVS according to the first DRVS and the second DRVS; and
the UDFD generator comprising:
a $Diff_{up}$ generator for generating a $Diff_{up}$ according to the first UVS and the second UVS;
a $Diff_{dn}$ generator for generating a $Diff_{dn}$ according to the first DVS and the second DVS; and
a UDDM for generating the UDFD according to the $Diff_{up}$ and the $Diff_{dn}$.

[c6] 6.The video signal separator of claim 5, wherein the UDFD is equal to $Lim(Diff_{dn}-Diff_{up})$, Lim() being a Sigmoid-like curve.

[c7] 7.The video signal separator of claim 5, wherein the first UVS comprises a Y_{cu}, a U_{cu} heading to a first direction and a V_{cu} heading to a second direction, which is not parallel to the first direction, and the second UVS comprises a Y_u, a U_u heading to the first direction and a V_u heading to the second direction, wherein $Diff_{up}$ is equal to $ABS(Y_u-Y_{cu})+SQRT((U_u-U_{cu})^2+(V_u-V_{cu})^2)$, ABS(x) being

an absolute value of x, and SQRT(y) being a square root of y.

[c8] 8.The video signal separator of claim 5, wherein the first DVS comprises a Y_{cd}, a U_{cd} heading to a first direction and a V_{cd} heading to a second direction, which is not parallel to the first direction, and the second DVS comprises a Y_{d}, a U_{d} heading to the first direction and a V_{d} heading to the second direction, wherein $Diff_{dn}$ is equal to $ABS(Y_{d}-Y_{cd})+SQRT((U_{d}-U_{cd})^{2}+(V_{d}-V_{cd})^{2})$, ABS(x) being an absolute value of x, and SQRT(y) being a square root of y.

[c9] 9.The video signal separator of claim 4, wherein the SLFD generator comprises:

a horizontal interference calculator for calculating a D_{hc} and an D_{hy} according to the target video signal and the plurality of reference video signals;

a vertical interference calculator for calculating a D_{hc} and an D_{hy} according to the target video signal and the plurality of reference video signals;

an H_{diff} generator for generating an H_{diff} according to the D_{hc} and the D_{hy};

an V_{diff} generator for generating an V_{diff} according to the D_{vc} and the D_{vy}; and

an SLFD module for generating the SLFD according to the H_{diff} and the V_{diff};

wherein the SLFD is equal to $Lim(k*V_{diff}-H_{diff})$, Lim() being a Sigmoid-like curve, and k a weighing factor.

[c10] 10.The video signal separator of claim 9, wherein the horizontal interference calculator comprises:

a first adder for generating a first vertical luminance interfering signal by adding an upward reference video signal to the target video signal, the upward reference video signal lagging the target video signal by a predetermined number of horizontal scan lines;

a first 1-D comb filter for transferring the vertical luminance interfering signal into a first vertical luminance filtered signal;

a second adder for generating a second vertical luminance interfering signal by adding a downward reference video signal to the target video signal, the downward reference video signal leading the target video signal by the predetermined number of horizontal scan lines;

a second 1-D comb filter for transferring the second vertical luminance interfering signal into a second vertical luminance filtered signal;

a third adder for generating a vertical luminance signal by adding the first vertical luminance filtered signal to the second vertical luminance filtered signal;

a first absoluter for transferring the vertical luminance signal into a positive vertical luminance signal;

a first low pass filter for transferring the positive vertical luminance signal into the D_{hy};

a sample point delay circuit for generating a rightward reference video signal by delaying the target video signal by two sampling points;

a subtractor for generating a horizontal chrominance interfering signal by subtracting the rightward reference video signalfrom the target video signal;

a 2-D comb filter for transferring the horizontal chrominance interfering signal into a horizontal chrominance filtered signal;

a second absoluter for transferring the horizontal chrominance filtered signal into a positive horizontal chrominance signal; and

a second low pass filter for transferring the positive horizontal chrominance signal into the D_{hc}.

[c11] 11.The video signal separator of claim 9, wherein the vertical interference calculator comprises:

a first subtractor for generating a first vertical chrominance interfering signal by subtracting an upward reference video signal from the target video signal, the upward reference video signal lagging the target video signal by a predetermined number of horizontal scan lines;

a second subtractor for generating a second vertical chrominance interfering signal by subtracting a down-

ward reference video signal from the target video signal, the downward reference video signal leading the target video signal by the predetermined number of horizontal scan lines;

a third subtractor for generating a vertical chrominance signal by subtracting the first vertical chrominance interfering signal from the second vertical chrominance interfering signal;

a third absoluter for transferring the vertical chrominance signal into a positive vertical chrominance signal;

a third low pass filter for transferring the positive vertical chrominance signal into the D_{vc};

a fourth adder for generating a first luminance interfering signal by adding a first rightward reference video signal to the upward reference video signal, the first rightward reference video signal lagging the upward reference video signal by twice an inverse of the sampling frequency;

a fifth adder for generating a second horizontal luminance interfering signal by adding a second rightward reference video signal to the downward reference video signal, the second rightward reference video signal leading the downward reference video signal by twice an inverse of the sampling frequency;

a fourth subtractor for generating a horizontal luminance signal by subtracting the first horizontal luminance in-

terfering signal from the second horizontal luminance interfering signal;

a fourth absoluter for transferring the horizontal luminance signal into a positive horizontal luminance signal; and

a fourth low pass filter for transferring the positive horizontal luminance signal into the D_{vy}.

[c12] 12.The video signal separator of claim 4, wherein the video signal is an NTSC (National Television Standards Committee) video signal.

[c13] 14.The video signal separator of claim 5, wherein the video signal is a PAL (phase alternation by line) video signal.